ABSTRACT

A disaster prediction system that provides a plurality of mobile communications apparatuses with a function for detecting abnormal signals that are effective in natural disaster prediction, manages location information for the mobile communications apparatuses and appropriately sets areas of natural disaster prediction, collects a plurality of abnormality detection signals from the mobile communications apparatuses, analyzes these signals per area of prediction, improves the accuracy of natural disaster occurrence prediction, and transmits natural disaster-related information to a plurality of mobile communications apparatuses present in the areas of prediction. In this system, a mobile terminal 200 is equipped with functions for detecting an electromagnetic signal which correlates with earthquake occurrence and which comes from underground and detecting an abnormal electromagnetic signal and a function for locating its present position, a location management apparatus 300 manages location information for a plurality of mobile terminals 200, and an earthquake prediction apparatus 400 appropriately sets the areas of prediction of earthquake occurrence, according to the location management information, and collects a plurality of abnormality detection signals from the mobile terminals 200, generates earthquake-related alert information

based on analysis per area of prediction, and transmits that information to the mobile terminals 200.

FIG.1

500 BASE STATION

NETWORK N

400 EARTHQUAKE PREDICTION APPARATUS

300 LOCATION MANAGEMENT APPARATUS

200 MOBILE TERMINAL

204 ABNORMAL SIGNAL DETECTION SECTION

205 LOCATION DETECTION SECTION

202 WIRELESS COMMUNICATIONS SECTION

203 CONTROL SECTION

206 OPERATION SECTION

207 DISPLAY SECTION

FIG.2

202 WIRELESS COMMUNICATIONS SECTION

2021 WIRELESS SECTION

2021a RECEPTION SECTION

2021b TRANSMISSION SECTION

2022 DIGITAL SIGNAL PROCESSING SECTION

2022a DECODING SECTION

2022b ENCODING SECTION

203 CONTROL SECTION

GENERAL-PURPOSE BUS

2032 STORAGE SECTION

FIG.3

209 RADIO RECEPTION SECTION

204 ABNORMAL SIGNAL DETECTION SECTION

2041 THRESHOLD 1

2042 COMPARISON SECTION

ABNORMALITY DETECTION SIGNAL

TO CONTROL SECTION

FIG.4

205 LOCATION DETECTION SECTION

2052 GPS RECEPTION SECTION

2053 SIGNAL PROCESSING SECTION

TO CONTROL SECTION

FIG.5

FROM CONTROL SECTION

206 OPERATION SECTION

2061 ROTATION CONTROL SECTION

2062 VIBRATION MOTOR

FIG.6

FROM CONTROL SECTION

206 OPERATION SECTION

2061 FLASH CYCLE/LIGHT EMISSION INTENSITY ADJUSTMENT SECTION

2062 LIGHT EMISSION SECTION

FIG.7

FROM CONTROL SECTION

206 OPERATION SECTION

2061 SOUND/MUSIC DATA STORAGE SECTION

2062 REPRODUCTION SECTION

2063 VOLUME ADJUSTMENT SECTION

2064 SPEAKER

FIG.8

FROM CONTROL SECTION

206 OPERATION SECTION

2061 IMAGE DATA STORAGE SECTION

2062 REPRODUCTION SECTION

2063 DISPLAY SECTION

FIG.9

TO NETWORK N

300 LOCATION MANAGEMENT APPARATUS

301 COMMUNICATIONS SECTION

302 CONTROL SECTION

303 STORAGE SECTION

FIG.10

USER MANAGEMENT DB 1000

USER ID	NORTH LATITUDE	EAST LONGITUDE	IP ADDRESS
USER 1	AB DEGREES	CD DEGREES	
USER 2	XY DEGREES	YY DEGREES	
USER 3	YY DEGREES	ZY DEGREES	
		AREA 2	AREA 1

FIG.11

TO NETWORK N

400 EARTHQUAKE PREDICTION APPARATUS

401 COMMUNICATIONS SECTION

402 CONTROL SECTION

403 STORAGE SECTION

404 PREDICTION SECTION

FIG.12

USER REPORT DB 1200

USER ID FREQUENCY REPORT RECEPTION TIME

USER 1

USER 2

USER 3

USER 2

USER 3

USER 2

SAME TIME PERIOD (WITHIN 3 MIN.)

FIG.13

AREA 1

HOT SPOT (BASE STATION 500)

EARTHQUAKE SENSOR

ABNORMAL ELECTROMAGNETISM

USER 1

AREA 2

500 BASE STATION

USER 2

ABNORMAL ELECTROMAGNETISM

USER 3

ABNORMAL ELECTROMAGNETISM

NETWORK N

400 EARTHQUAKE PREDICTION APPARATUS

300 LOCATION MANAGEMENT APPARATUS

FIG.14

AMPLITUDE

THRESHOLD 1

TIME

FIG.15

209 RADIO RECEPTION SECTION

1500 ABNORMAL SIGNAL DETECTION SECTION

2041 THRESHOLD 1

1502 TIMER

1504 THRESHOLD 2

1501 COMPARISON SECTION

1503 COUNTER

1505 COMPARISON SECTION

1506 CALCULATION SECTION

ABNORMALITY DETECTION SIGNAL

COUNT VALUE

MAX VALUE

AVERAGE VALUE

TO CONTROL SECTION

FIG.16

AMPLITUDE

THRESHOLD 1

TIMER CYCLE

COUNT VALUE

TIME

ABNORMALITY DETECTION, WHEN THRESHOLD 2 = 5

FIG.17

209 RADIO RECEPTION SECTION

1700 ABNORMAL SIGNAL DETECTION SECTION

2041 THRESHOLD 1

1502 TIMER

1501 COMPARISON SECTION

1503 COUNTER

1506 CALCULATION SECTION

1701 BUFFER

1702 COMPARISON SECTION

1703 TIMER

1504 THRESHOLD 2

1704 COUNTER

1505 COMPARISON SECTION

ABNORMALITY DETECTION SIGNAL

COUNT VALUE 2

COUNT VALUE 1

MAX VALUE

AVERAGE VALUE

TO CONTROL SECTION

FIG.18

USER REPORT DB 1800

USER ID FREQUENCY

MAX VALUE AVERAGE VALUE REPORT RECEPTION TIME

USER 1

USER 2

USER 3

USER 2

USER 3

USER 2

SAME TIME PERIOD (WITHIN 3 MIN.)

FIG.19

START

S101 IS MAX VALUE GREATER THAN OR EQUAL TO REFERENCE VALUE?

S102 IS AVERAGE VALUE GREATER THAN OR EQUAL TO REFERENCE VALUE?

S103 IS FREQUENCY GREATER THAN OR EQUAL TO REFERENCE VALUE?

S104 IS THE NUMBER OF REPORTS IN SPECIFIED AREA GREATER THAN OR EQUAL TO REFERENCE VALUE?

S105 COUNT UP

S106 RECEIVED IN SAME TIME PERIOD?

S107 ALERT OF ZONE 1 LEVEL TO USERS WITHIN SPECIFIED AREA

S108 ALERT OF ZONE 2 LEVEL TO USERS WITHIN ADJACENT AREA

END

FIG.20

TIMER 1 CYCLE

TIMER 2 CYCLE

VALUE OF COUNTER 1

TEMPORARILY HELD VALUE

VALUE OF COUNTER 2

ABNORMALITY DETECTION, WHEN THRESHOLD 2 = 3

FIG.21A

SPREAD OVER TIME AND STRENGTH OF DISASTER

ZONE 1

ZONE 2

FIG.21B

ZONE 1

THERE IS FEAR OF EARTHQUAKE. EVACUATION IS RECOMMENDED.

ZONE 2

EARTHQUAKE OF SEISMIC INTENSITY 5 IS GOING TO OCCUR SOON. EVACUATE IMMEDIATELY.

FIG.22A

ADAPTIVE ARRAY ANTENNA

USER

BASE STATION

USER IDENTIFICATION INFORMATION

FIG.22B

COMMON CHANNEL

USER IDENTIFICATION INFORMATION

ALERT SIGNAL